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1. *M. ciliare* (Grev.) Lindb.=*M. affine*, var. *ciliare* (Grev.) C. M. See Limpricht "Laubmoose," p. 479.
2. *M. cinclidioides* (Blytt) Hübn. of B.=*M. cinclidioides* Hübn. of L. & J. and D. & J. and *M. cinclidioides* Blytt .of H.
3. *M. cuspidatum* (L.) Neck. of B.=*M. affine* Bland. of L. & J. and D. & J. and *M. affine* Schw. of H. Its varieties are *M. affine*, var. *elatum* B. & S. of authors cited. *M. affine*, var. *rugicum* B. & S. of L. & J. and D. & J.=*M. affine*, var. *rugicum* Laur. of B.
4. *M. Drummondii* B. & S. of L. & J.
5. *M. hornum L.* Same by four authors cited.
6. *M. hymenophylloides* Hübn. of L. & J. and H.
7. *M. marginatum* (Dicks.) P. Beauv. of B. & H.=*M. serratum* Laich of L. & J.=*M. serratum* Schrad. of D. & J.
8. *M. medium* B. & S. of L. & J.=B. note Vol. II., p. 243=*M. affine* Schw., var. *medium* of H.
9. *M. orthorrhynchum* B. & S.=Same by all authors cited.
10. *M. punctatum* Hedw. of L. & J. and H.=*M. punctatum* L. of B. and D. & J.=*M. punctatum* Hedw. var. *elatum* B. & S. of L. & J. and H.=*M. punctatum* L. var. *elatum* Schimp. of B. and D. and J.
11. *M. pseudopunctatum* B. & S. of B.=*M. subglobosum* B. & S. of L. & J., D. & J., and H.
12. *M. pseudolycopodioides* C. M. & Kindb.=*M. lycopodiodes* (Brid.) Schwaegr. of L. & J. See note under key.
13. *M. silvaticum* Lindb. of B.=*M. cuspidatum* Hedw. of L. & J. and H.
14. *M. spinulosum* B. & S. of L. & J. and H. See note, D. & J., p. 348.
15. *M. stellare* Reich. of all authors cited.
16. *M. rostratum* Schrad. of B. and D. & J.=*M. rostratum* Schwagr. of L. & J. and H.—*A. M. S.*

SOME ADDITIONAL NOTES ON THE METHODS OF MICROSCOPIC EXAMINATION OF MOSSES.

By John M. Holzinger.

THE electric current runs along the line of least resistance. So, in our working methods on mosses, we strive to find a plan that shall lead to results exact and satisfactory by a way most direct and least expensive of time and tools. I have read with interest the article on this subject in the April BRYOLOGIST; and since my own method of work is in part different from those described, I gladly furnish it to our younger moss students, hoping that some of them may try it and find it as satisfactory as the writer.

In the first place, I invariably prepare my dry material for examination by simply soaking it in a tumbler of cold water for a sufficient length of time. The usual time required for examining one moss is almost always sufficient to soak up the next victim. The only time when a moment's boiling over a flame becomes necessary is when spores interfere with the study of the peristome, after the dissection of a recently ripe and still operculate capsule.

In the second place, I work almost entirely with mounted needle and small convex edged scalpel *under* the arm-supported lens of a dissecting microscope, whether it be in removing leaves from stems, for examination entire, or in making sections of leaves or of stems, or of capsules, or in searching for gametophytes and sporophytes. I remove only the largest leaves, as of Polytrichium, of some Mniums, etc., with simply scalpel and tweezers. I suppose everyone can work best by that method to which he has become accustomed, and in which he has become practiced, from the beginning, whether it involves the use of pith, or simply of the thumb nail and razor. But I believe the method I have suggested is, on the whole, the simplest, most certain and most satisfactory, because most expeditious. May I tax the patience of my readers with one illustration?

Suppose I have soaked up some plants of an Orthotrichum which occurs around Winona on limestone boulders, for critical study. I carefully select a plant as perfect as possible, *i. e.*, with leaves unbroken, and fresh, with a fully ripe capsule, but not so old as to have a demoralized peristome, placing it on a glass slip in as much water as will adhere to it. This slip is put on the dissecting stage, under the lens, to be cursorily examined. If earth, sand or vegetable debris adhere to it, I endeavor with needle and scalpel to float this superfluous material away from the specimen. I may wash it thus, on the glass slip, through several waters. When perfectly clean, it is ready for detailed dissection. I decide to examine leaves, both entire and in cross-section, the capsule wall to determine whether it is cryptopore or phaneropore, and the peristome.

I remove several leaves from the base of my plant, carefully cutting off short pieces of stem from below up, and pressing off the lowest leaves with needle and scalpel. (In some cases I get good results readily by scraping the leafy stem downward, and selecting those least broken up.) From a lot thus separated I select several for examination entire, removing them to another clean glass slip into a drop or two of clean water, or dilute glycerine, and covering them with a cover glass. They are now ready for the compound microscope, and may be temporarily laid aside till all the other slips are prepared.

The preparation of cross sections of the leaves is a somewhat more delicate task. I again select three or four of the best leaves, and transfer them to another slip into a little water. Under the dissecting lens I now endeavor to hold them with bent needle down into the water on the slip, bases toward me and to the left, apex away from me and toward right. This with the left hand. Then I cut with a chop-knife motion across the leaves, endeavoring to cut very thin, parallel slices. The scalpel of course must be kept very sharp, and I always keep a fine hone and razor strop on my work table. The difficulty of this operation, which is viewed through the lens, is fast diminished by practice. It arises from the surface tension of the water, which is somewhat violently disturbed by the touch of the scalpel, on the edge of which a meniscus leaps up to a microscopically considerable height, causing the small moss pieces to dance a lively jig for a moment, and throwing them into confusion. With this disturbance one soon learns to reckon in this process of working. The thinnest sections are soon selected, and are lifted with needle and scalpel on to another slip into a drop of water or glycerine, and covered with a circle.

The capsule I cut crosswise first, close to the peristome. If spores are too abundant, and are likely to interfere with the examination, I endeavor to press and work out the bulk of them, transferring the washed parts to another slip with a drop of water. Then I split each part again lengthwise; the base of the capsule thus split is carefully laid with outer surface turned *upward;* the peristome pieces are arranged so that one has the *outer*, the other the *inner* surface turned upward, for obvious reasons. The parts are then covered with a cover glass, and everything is ready for a detailed microscopic examination.

Finally, if it is found necessary to determine the presence of the gametophyte on the plant, as perfect a plant as possible is selected after soaking, and is carefully looked over with the dissecting lens for small buds of somewhat different construction than ordinary short stems. These buds are then split lengthwise in a drop of water, the parts floated out, and covered.